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BERYLLIUM at ARGONNE EAST PAST & PRESENT

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EARLY HEALTH & SAFETY EXPERIENCE

The focus of this presentation is the present activities at Argonne related to the control of beryllium exposure. However, since our present activities involve some of the past uses of beryllium, we will review briefly the history as we have been able to resurrect it from records, memory and interviews with some of the people involved.

Argonne was established as the first national laboratory on July 1, 1946, about 6 months prior to the creation of the Atomic Energy Commission. Beryllium has been used since the first days of the Laboratory, and even before that, as many of the personnel and programs were transfers from the original Metallurgical Laboratory at the University of Chicago at Stagg Field where Enrico Fermi's team produced the first sustained chain reaction in a reactor pile on Dec. 2, 1942. There is mention of work as early as 1941 involving uranium, beryllium and carbon. Projects were moved from the U. Of C. to a Site B (for brewery) in south Chicago where a beryllium foundry was operated, and to Site A in the Palos Hills Forest Preserve in Cook County. Later, facilities were moved to this site in DuPage County. By 1951 a number of temporary Quonset huts had been constructed and major buildings including Chemistry, Chemical Engineering and Physics were complete.

In this same time frame, the health hazard of beryllium was recognized within the AEC. A committee appointed by the AEC made a recommendation on March 30, 1950 that the workplace concentration of beryllium should not exceed 2 micrograms per cubic meter of air as an 8 hour TWA nor exceed a ceiling level of 25 micrograms per cubic meter of air. In addition, a neighborhood ambient air concentration guideline of 0.01 microgram per cubic meter was set as an average monthly concentration limit. As far as we know, these were the first such standards set for beryllium.

These guidelines were in effect at Argonne in 1948, about 2 years prior to the official publication by the AEC.

Also as early as 1948, Argonne's Director of Health Services, Dr. Robert Hasterlick, identified beryllium and alpha emitters such as radium as the most pressing medical research problems. There was also recognition of the need for exposure monitoring and engineering control of exposure with the growing use of beryllium. In fact, Argonne's first industrial hygienist, John Ege, was hired to address these needs.

A dedicated machine shop was constructed at this site in 1949 which had complete enclosure hoods for each machine and a dedicated exhaust system which cleaned the air through a Rotoclone wet scrubber, electrostatic precipitator and filter bank. Figure 1 shows the general layout of the

beryllium machine shop. The photo was used in an article published in American Machinist in 1955 and is believed taken at that time. The original hoods had Lucite sliding windows which soon became scratched, affecting visibility, and the cloth bellows sealing some openings began to deteriorate. A decision was made in the mid 1950's to replace all of the hoods with ones constructed of steel and safety glass windows utilizing a telescoping box design and an envelope to enclose the sliding glass panels. Figure 2 shows the enclosure hood for one of the machines. The hoods were designed by a machine shop foreman familiar with beryllium machining techniques and were individually tested for air flow patterns by the Industrial Hygiene Group as they were completed. Figure 3 is a machine cleaning operation, showing the flexible duct connection directly to the local exhaust ventilation system.

Air sampling was conducted in the shop whenever any work was done there, including room cleaning operations. Several hundred surveys were completed, though most of these were general air type samplers in the room rather than personal breathing zone monitors. Air concentrations were generally well below the AEC standard. In one study in the mid 1950's an average concentration of 0.13 microgram per cubic meter was found (about 6% of the exposure standard). This level of control, normally well below the standard, continued through the closure of the shop in the early 1980's. Although not matching the sophistication of ventilation control and monitoring planned for the state of the art facility being built at Los Alamos, this facility did demonstrate a recognition of the serious health effects of beryllium and a dedication to maintain exposures at a minimum.

Argonne's experience with beryllium does, however, include several cases of beryllium disease, although to our knowledge, most if not all involved personnel who had been exposed at conditions less well controlled and prior to the establishment of the dedicated machine shop.

PRESENT ACTIVITIES IN BERYLLIUM EXPOSURE CONTROL

Our present uses of beryllium are intermittent and involve relatively few people. The current identified inventory lists about 2 dozen products and 16 custodians of beryllium and beryllium compounds. Activities are focused on identifying any remaining beryllium materials and capturing these into the site wide chemical inventory system, reviewing and monitoring beryllium use, and assuring that personnel who may work with beryllium are aware of the need for strict exposure control. Identification of employees who may have been exposed to beryllium and who may benefit from additional medical surveillance is also a priority. With the intermittent nature of beryllium use, an important goal is the provision of the appropriate services commensurate with the level of activities and risk. Knowledge and commitment on the part of line management is most important to make this happen in an efficient way.

The main provisions of the Argonne East beryllium control plan are incorporated in the Argonne ESH Manual chapter on beryllium, now undergoing final internal review, which was designed to address the issues raised in the DOE notice on beryllium exposure control.

PAST CONTAMINATED AREAS

Division ESH representatives have been advised to review past uses of beryllium to identify any potentially contaminated areas. Assistance of the Industrial Hygiene & Safety Section in evaluating these areas is provided. The major beryllium use areas, the machine shop and associated air cleaning equipment in an adjacent building, were removed in the mid 1980's. These buildings were part of a complex of Quonset huts; all the buildings in this vicinity have been removed. Special precautions to prevent inhalation of beryllium were taken and monitoring was provided for certain operations of the dismantling process. A potential for beryllium contamination has been recognized in the areas where beryllium is currently stored; this is being evaluated. Some residual contamination was also identified in one laboratory hood where beryllium use previously occurred.

INVENTORY

Argonne has had a site-wide computerized Chemical Management System (CMS) operating for several years. This includes laboratory scale and bulk chemicals but did not capture all of the stockpile of beryllium metal. An effort is underway to include all of this material into the existing site inventory. Figure 4 is the basic layout of the modules of the CMS. Figure 5 shows the ANL ordering system, which has links to the CMS to capture the purchase of chemical items to create an inventory record and ensures that a Material Safety Data Sheet is available.

ROSTER DEVELOPMENT

The number of current employees with potential for exposure to beryllium is small. Efforts are underway to systematically identify those employees with current or past potential beryllium exposure. Sources of information for this process are shown in Figure 6.

Workplace monitoring records have been recorded in a database since the early 1990's. Beryllium is an exception - all the air monitoring records dating back to the 1950's have been entered into the system, which contains over 3600 beryllium records.

There is also a Job Hazards Questionnaire, which in its earliest versions, asked specifically about beryllium use. The current Physical Requirements/Working Environment form also asks about beryllium. These forms are completed by all employees.

Other sources include the beryllium transfer records which were used for all movement of beryllium for at least a decade, and signature authorizations for certain reactor materials including beryllium.

These records along with contemporary use reviews are being collected and sorted into a listing to identify a roster of current workers who have or may have had, beryllium exposure potential.

NEW BERYLLIUM PROJECT ASSESSMENT

Division ES&H personnel have been informed via memos , safety meetings, and the draft ESH Manual Chapter of the need for careful assessment and monitoring of projects involving use of beryllium. Industrial Hygiene staff are expected to participate in this process to provide guidance on exposure control methods and exposure monitoring of beryllium use.

TRAINING AND INFORMATION

Providing beryllium users with appropriate information and training is an important aspect of ensuring that beryllium is handled safely. The intermittent nature and level of beryllium use does not lend itself to effective use of regularly scheduled class room training. However, a basic beryllium hazards training module is being developed for presentation on an as needed basis by Industrial Hygiene or division safety personnel. We have available the training materials developed by the DOE Beryllium Training Development Task Force, as well as video tapes and other material developed by Brush-Wellman Corp.

EXPOSURE MONITORING

An important feature in verifying the effectiveness of all of the above activities in controlling beryllium is documenting the level of potential exposure during work activities. The Industrial Hygiene & Safety Section provides this service site wide, and notifies the user division management of the results of surveys and any recommended corrective actions. Divisions are informed of their responsibility to inform all affected workers of monitoring results. Workplace exposure monitoring results for beryllium and all other toxic materials are maintained by ESH Industrial Hygiene.

SUMMARY

The goal of our program is to identify past contaminated areas for remedial action, identify employees with past and current exposure who may benefit from additional medical monitoring and provide guidance and support so that any ongoing activities involving beryllium are conducted safely. Policy for these activities is established in the ANL-E ESH Manual chapter titled "Beryllium".

